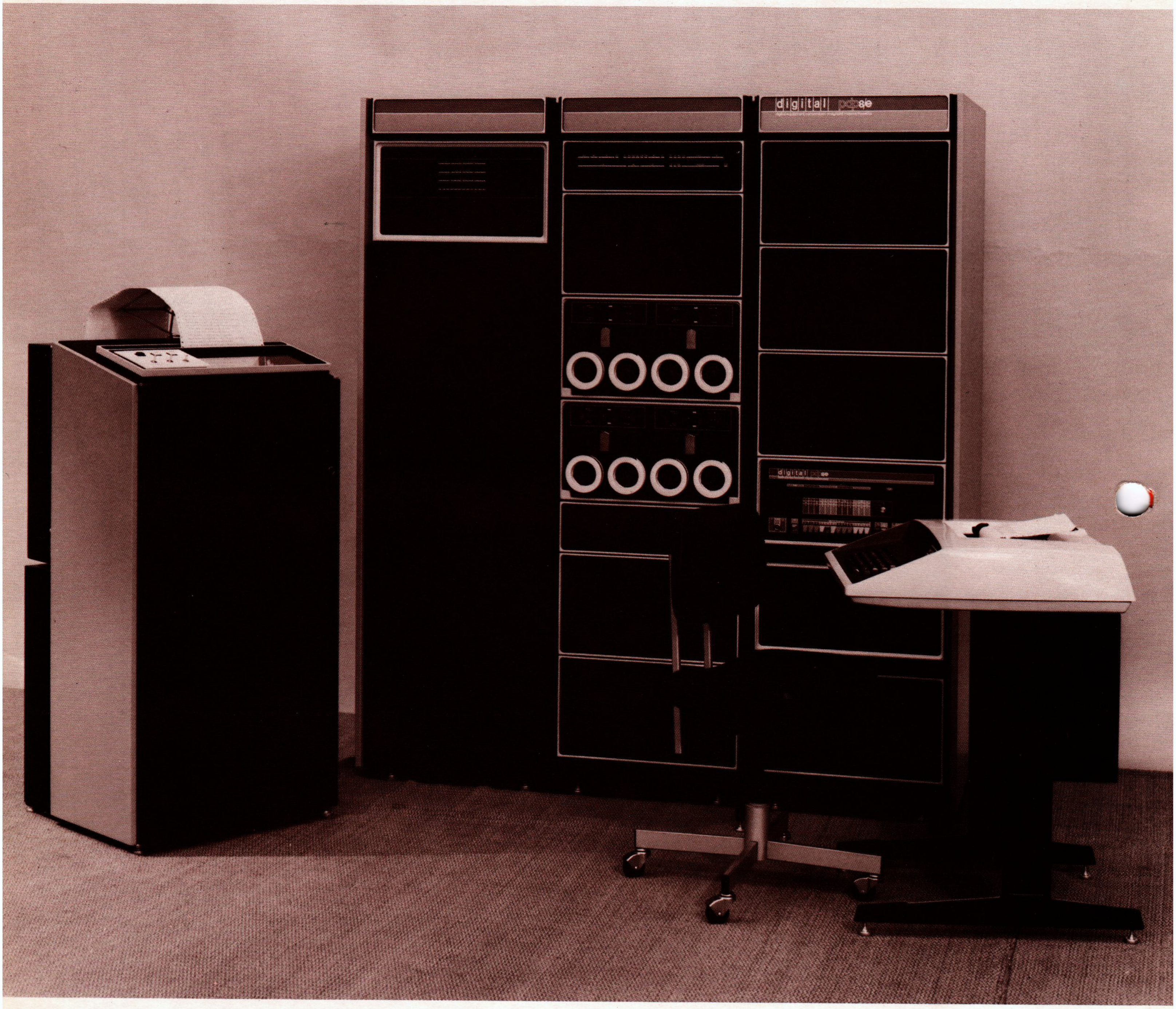
TIMESHARED-8



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TIMESHARED-8E

Timeshared-8 (also known as TSS/8 or EduSystem 50) combines powerful multi-language timesharing software with the proven dependability and economy of the PDP-8/E computer. The system allows up to 17 users simultaneous access to a multi-language, interactive, resource/timesharing system for a *cost of under $1.00 per terminal hour.*

Timeshared-8 runs an exceptionally powerful version of the BASIC language as well as FORTRAN, ALGOL, Assembly Language, FOCAL, QUICK-POINT, and a full complement of utility software for editing, debugging, and device handling. *And all languages are available simultaneously.*

A key advantage of Timeshared-8 over other timesharing systems is that each user has access to all the system peripherals and devices. The ability of any user to access any system device is called *resource sharing.* With resource sharing, peripheral devices such as disk storage units, magnetic tape units, high-speed paper tape reader and punch, card reader and line printer are available to any user *while the computer is timesharing.*

Timeshared-8 is the most versatile low-cost computer system available anywhere. Over 100 Timeshared-8 systems are in use today. They are used in schools for student problem-solving, science simulations, data reduction, business education, and administrative data processing. Industrial firms and government agencies use Timeshared-8 Systems for software development, computation, production of numerical control tapes, control of drafting machines, and a host of other applications.

DIGITAL EQUIPMENT CORPORATION

Digital was in a unique position to develop the Timeshared-8 system. In the large-scale timesharing field, DECsystem-10 is the established price/performance leader. It has the most powerful set of timesharing software ever written. On the other hand, Digital invented the mini-computer, pioneered its development, and is the world leader with over 18,000 installations, more than all the other computer manufacturers combined. In Timeshared-8, Digital has combined its unsurpassed small computer systems with the knowledge and experience gained from DECsystem-10 to produce a small-scale timesharing system with big computer power and flexibility.

INSTALLATIONS

INSTALLATIONS

Over 100 Timeshared-8 systems are operating today. It is undoubtedly the most successful small timesharing system available. A representative list of installations follows:

Secondary Schools

Area Nine Schools	Bettendorf, Iowa
Brockton High School	Brockton, Mass.
East Islip High School	Islip Terrace, N. Y.
Edison Technical High School	Rochester, N. Y.
Grand Forks Schools	Grand Forks, N. Dak.
Half Hollow Hills High School	Dix Hills, N. Y.
LaSalle Academy	New York, N. Y.
Lexington High School	Lexington, Mass.
Melrose High School	Melrose, Mass.
Middle Country Schools	Centereach, N. Y.
Needham High School	Needham, Mass.
Newport-Mesa Schools	Newport-Mesa, Calif.
Sierra Vista High School	Sierra Vista, Ariz.
South Portland High School	S. Portland, Maine

Colleges and Universities

Associated Colleges of Central Kansas	McPherson, Kan.
Bemidji State College	Bemidji, Minn.
Benedict College	Columbia, S. C.
Berkshire Community College	Pittsfield, Mass.
Brigham Young Univ.	Provo, Utah
Brooklyn College	Brooklyn, N. Y.
Cambridge Univ.	Cambridge, England
Carleton College	Northfield, Minn.
Carnegie-Mellon Univ.	Pittsburgh, Pa.
Catholic Univ. of Leuven	Leuven, Belgium
City Univ. of New York	New York, N. Y.
Clarkson College	Pottsdam, N. Y.
Clemson Univ.	Clemson, S. C.
Emory and Henry College	Emory, Va.
Florida State Univ.	Tallahassee, Fla.
Hollins College	Hollins College, Va.
Indiana Univ.	Bloomington, Ind.
Northern Arizona Univ.	Flagstaff, Ariz.
Oak Ridge Associated Universities	Oak Ridge, Tenn.
Ontario Institute for Study in Education	Toronto, Ontario
Polytechnic Institute of Brooklyn	Brooklyn, N. Y.
Red River Community College	Winnepeg, Manitoba
Ripon College	Ripon, Wis.
St. Lawrence College	Cornwall, Ontario
Trinity College	Hartford, Conn.
University of Calgary (2)	Calgary, Alberta
University of Minnesota (2)	Minneapolis, Minn.
University of Wisconsin	Milwaukee, Wis.

Timesharing Service Bureaus

Digital Systems Associates	Ottawa, Ontario
Globe Union, Inc.	Milwaukee, Wis.
Remco	Racine, Wis.
Stanford Computer Corp.	Manilla, Philippines
Systems for Educational Time Sharing	Waltham, Mass.
Time-Share, Inc.	St. Louis, Mo.
Transnet Corp.	Red Bank, N. J.

Industry

Bayer Leverkusen	Cologne, W. Germany
Comsonic Corp.	Upper Saddle River, N. J.
ECRM	Cambridge, Mass.
Hoogovens	The Hague, Netherlands
Dr. Neher Laboratories	The Hague, Netherlands
Questel, Ltd.	London, England
Western Electric	Lisle, Illinois
Western Electric	Indianapolis, Ind.
Western Electric	Omaha, Nebr.

Government

Harry Diamond Laboratories	Washington, D. C.
Marshall Space Flight Center	Huntsville, Ala.
Material Support Command	Arlington, Va.
U. S. Army Signal Corps	Ft. Monmouth, N. J.

Other

Nature Conservancy	Manchester, England
Oregon Museum of Science & Industry	Portland, Oregon

APPLICATIONS

GENERAL PROBLEM-SOLVING

In schools Timeshared-8 is really a laboratory for testing and using mathematical methods and logical relationships. Timeshared-8 does not change *what* a student learns in class; rather it changes *how* he learns and *how fast* he learns. Instead of doing homework problems using a new concept, with Timeshared-8 students now write a computer program which uses the concept. A simple change, but one which school after school has found leads to profoundly better learning. And it's far more exciting to the students; virtually all of them respond to the challenge of working with the computer.

In training students in "General Problem Solving," the computer forces the student to break down a problem into manageable pieces, then to organize the pieces. The student works from a subject with which he is familiar to subjects with which he is not. Programming also teaches the student how to react to an approach which doesn't work. With an interactive computer, the student is continuously aware of his progress, hence he is motivated to isolate "bugs" and fix them.

But more than teaching problem solving, Timeshared-8 is the ideal computer to solve mathematical problems of all kinds. Statistical data reduction, beam loading, impedance of a circuit, heat of a chemical reaction, or return on an investment—all are problems which lend themselves to solution on Timeshared-8.

SIMULATION

A simulation is a mathematical and logical model of a real-world process programmed on the computer. Timeshared-8 can simulate a simple laboratory apparatus like an inclined plane or a more complicated apparatus like that used in Young's double slit experiment. By means of such simulations the computer can extend the range of standard laboratory equipment and shorten measurement time.

In other instances the computer simulates apparatus out of reach of most schools and laboratories; e.g., a linear accelerator, cryogenic chamber, or electron microscope. In fact, *virtually any* device or process can be simulated; for example, a lunar excursion module, a railroad network, a water table, or climatic pattern.

Some simulations compress time. For example, it's possible to study hundreds of generations of genetic mutations, or the life cycle of a river or lake or even of the planet, or insect control using pesticides versus male sterilization.

Nor are simulations limited to the "hard" sciences. Sociological interactions, population migration, public policy making, and decision-making in business all have been simulated on Timeshared-8.

PROGRAM DEVELOPMENT

Since Timeshared-8 essentially gives each user a 4K PDP-8/E, machine language programs can be efficiently developed under the interactive timesharing monitor for later use on a stand-alone machine. One large corporation uses Timeshared-8 systems at three different sites almost exclusively for program development and refining.

Developing machine language programs under Timeshared-8 versus a stand-alone PDP-8/E represents a time saving of about 40 to 1. Moreover, the cost for a 16-user Timeshared-8 is considerably less than for 16 individual machines.

COMPUTER SCIENCE

Most students can learn an extraordinary amount from the computer by using it as a tool in problem-solving and simulations. BASIC, FOCAL, FORTRAN, and ALGOL were specifically designed to make a complex device available to people who know nothing about computers *per se*.

However, Timeshared-8 is also an excellent system for students interested in how a computer functions. Computer science with Timeshared-8 progresses from binary and octal numbers to assembly language to assemblers, compilers, and interpreters and finally to operating systems.

Timeshared-8 alone, among small timesharing systems, can be used to teach computer science, not in stand-alone mode, but in the timesharing mode. This ability to service both those *using* the computer and those *learning about* the computer is a major advantage.

CAI, CMI

Computer Assisted Instruction (CAI), or the presentation of new concepts and the subsequent drill and practice to reinforce those concepts, is a use to which Timeshared-8 is well-suited. CAI is generally most useful in the early grades for students having difficulty grasping a new idea, or for students with a learning impediment, although it has been successfully used with medical students learning masses of factual material.

Computer Managed Instruction (CMI) is the use of the computer to continuously monitor individual achievement against a comprehensive set of objectives. Based on the results, students may be given remedial work, reassigned to other sections, or given a job as a student tutor. The CMI system available on Timeshared-8 is exceptionally comprehensive; a separate brochure is available describing the system.

SOFTWARE

BASIC

DARTMOUTH STANDARD BASIC

Timeshared-8 BASIC is a full implementation of BASIC as developed at Dartmouth College. In addition, Timeshared-8 BASIC has capabilities for program storage, data file storage, character strings, additional functions, multiple statements per line, editing, and an extensive set of over 70 error diagnostics. Timeshared-8 can handle programs of up to 350 lines in length, or virtually any length using program "chaining."

PROGRAM STORAGE

Programs may be stored on DECtape or disk in either source language or compiled form. Compiled programs execute faster and are fully protected from unauthorized access. In addition, programs may be punched out on high- or low-speed paper tape, or listed on the line printer from any terminal.

DATA FILE STORAGE

Timeshared-8 allows data files to be created and stored for later use on disk or DECtape. One program may access up to 100 files. Files may be up to 370,000 characters in length. They are opened and named with the "OPEN" command and closed with the "CLOSE" command. Information is stored using "PUT" and retrieved using "GET". File structure is specified with the "RECORD" statement. Numeric BASIC data files are compatible with OS/8 FORTRAN, so files can be created under timesharing for later batch processing under OS/8.

CHARACTER STRINGS

Alphanumeric string processing allows strings of up to 6 characters or *arrays of strings* (1- and 2-dimensional) to be input, manipulated, compared, and output using READ, INPUT, LET, IF, CHANGE, and PRINT.

MULTIPLE STATEMENTS PER LINE

With Timeshared-8 BASIC, longer programs can be written in a given amount of core, without chaining, by using several statements on a line. For example, a program to print a table of square roots might be:

```
10 FOR N=1 TO 100\PRINT N, SQR(N)\NEXT N\END
```

CALCULATOR MODE

A second version of BASIC on Timeshared-8 allows the immediate execution of mathematics problems without writing a program. For example:

```
:(−5 + SQR(5 ↑ 2-4*2*12))/ (2 * 2)
1.5
```

A solution of $f(x)=2x^2+5x+12$

EDITING

Frequently, it is necessary to correct only one or two characters in an incorrect BASIC line. Rather than retyping the entire line, which may be a complex formula or output statement, the EDIT command allows the user to access a single line and change only that portion in error. Using EDIT, items may be deleted, inserted or changed.

BASIC STATEMENTS

STATEMENT	DESCRIPTION
INPUT/OUTPUT	
CLOSE f	Close file f.
DATA $n_1,n_2,.....n_n$	Numbers n_1 thru n_n =variables in READ.
GET f,l,r	Read record r, form as in line l, from file f.
INPUT v_1, v_2,.....v_n	Get v_1 thru v_n input from TTY.
LINPUT $v\$_1$, $v\$_2$,.....$v\$_n$	Get long character string input from TTY.
LPRINT e_1, e_2,.....e_n	Print values of specified text or expressions on line printer or high-speed paper tape punch.
OPEN f, n$	Open a file named n$ as file #f.
OPEN f ELSE n	Open a file, go to line n if unavailable.
PRINT e_1, e_2,.....e_n	Print values of specified text, variables, or expressions. Format control (, or ;).
PUT f, l, r	Write record r, form as in line l, in file f.
READ v_1, v_2,.....v_n	Read variables v_1 thru v_n from DATA list.
RECORD v_1, v_2,.....v_n	Define the size and composition of record.
RESTORE	Reset DATA pointer to beginning value.
RESTORE*	Reset DATA pointer for numeric data only.
RESTORE $	Reset DATA pointer to character string data only.
UNSAVE f	Delete file f from disk storage.
TRANSFER OF CONTROLS	
GO TO l	Transfer control to line #l.
IF e1 r e2 GO TO l	Same as IF-THEN.
IF e1 r e2 THEN l	If relationship r between e1 and e2 is true, transfer control to line #l.
ON e1 GOTO l_1, l_2,...l_n	Computed GOTO.
LOOPS AND SUBSCRIPTS	
DIM $v(d_1)$, $v(d_1, d_2)$	Dimensions, variables subscripted.
FOR v=e1 TO e2 STEP e3	Set up program loop. Define v values beginning at e1 to e2, incremented by e3.
NEXT v	Terminate program loop (increment value of v, until v > e2).
SUBROUTINES	
GOSUB l	Enter subroutine at line l.
RETURN	Return from subroutine to statement following GOSUB.
STOP	Transfer control to END statement.
OTHERS	
CHAIN $_n$$	Links to next program.
CHANGE v_1 to v_2	Change character string to array of character codes.
DEF FNA(x)=f(x) DEF FNA(x,y)=f(x,y)	Define a function.
END	End of program.
LET v=e	Assign value of expression e to variable v (LET is optional)
RANDOMIZE	Randomizes random number routine.
REM text	Insert a remark or comment.
SLEEP n	Cause program pause for n seconds.

BASIC COMMANDS

System includes comprehensive set of 21 BASIC Edit, Utility, Program Control and Peripheral Device Control Commands.

SOFTWARE

FORTRAN

FORTRAN-D

FORTRAN (an acronym for FORmula TRANslation) was originally designed as a scientific batch processing language. FORTRAN-D is based on FORTRAN but relaxes the rigid format specifications to make the language more amenable to interactive program development and problem-solving. Extensive error diagnostics during program compilation and execution aid novice programmers.

PROGRAM AND DATA FILE STORAGE

FORTRAN programs may be stored in either source language for editing and development or compiled binary form for efficiency with frequently used programs. Data files may be manipulated on the disk with the READ and WRITE statements; two data files may be open simultaneously.

INTERACTIVE INPUT

Because the user terminal is so frequently used for input and output, FORTRAN-D includes two special I/O instructions: ACCEPT and TYPE. These instructions perform the same functions as READ and WRITE but without the necessity of specifying the device code; RUBOUT is permitted on input of data using ACCEPT.

FORTRAN-D STATEMENTS

STATEMENT	DESCRIPTION
ARITHMETIC	
v=e	Set variable v equal to expression e.
GO TO n	Branch to statement n
GO TO (n_1, n_2,...n_n), i	Computed GO TO.
IF (e)n_1, n_2, n_3	Branch to statement n_1, n_2, or n_3 if expression e is less than, equal to, or greater than zero.
DO n i=k_1, k_2, k_3	Execute operations through statement n for values of i from k_1 to k_2 in increments of k_3.
CONTINUE	Proceed
STOP	Terminate execution.
END	Last statement in program.
SPECIFICATION	
DIMENSION v_1 (n_1), v_2 (n_2)	Establish arrays for variable v of size n.
DEFINE DISK	DISK to be used for input/output.
FORMAT (s_1, s_2...s_n)	Input/output according to data field specifications s_1, s_2...s_n
COMMENT	Non-executing line.
INPUT/OUTPUT	
ACCEPTf, list	Accept input from teletype, f is FORMAT statement, list is a list of variables.
TYPE f, list	Print output on teletype.
READ u, f, list	Read data from device u.
WRITE u, f, list	Write output to device u.

PAL-D ASSEMBLY LANGUAGE

PROGRAM ASSEMBLY LANGUAGE

PAL-D (an acronym for Program Assembly Language—Disk) is the assembly language (machine language) of the PDP-8/E computer. Using PAL-D the timesharing terminal user has access to the equivalent of a full PDP-8/E disk monitor system with 35 additional monitor commands for powerful input, output, and device control.

AUTOMATIC ASSEMBLY

PAL-D is a three-pass assembler. During the first pass, user symbols are defined and stored. During the second pass, the binary equivalents of the input source language are generated and the symbol table is printed. The third pass produces a printed assembly listing. Under the Timeshared-8 monitor an assembly is done automatically and requires no operator intervention between passes. Timeshared-8 is programmed by the user just like any 4K PDP-8/E; all memory reference instructions and operate instructions function just as on a stand-alone computer.

POWERFUL INPUT/OUTPUT

Timeshared-8 places many input/output transfer (IOT) instructions not available in stand-alone operation at the user's disposal. User programs interact with multi-character buffers rather than with single-character registers. This interaction allows I/O manipulation of strings of characters. Hence, a user can run programs of greater complexity in his 4K core area than could be run on a stand-alone machine.

PAL-D INSTRUCTION SET

Type of Instruction	*Number Available*
Memory Reference Instructions	6
Group 1 Operate Micro-instructions	10
Group 2 Operate Micro-instructions	9
Combined Operate Micro-instructions	5
Pseudo Operators	11
Program Interrupt IOT	1
Keyboard Reader IOT	7
Teleprinter/Punch IOT	5
High-Speed Reader IOT	4
High-Speed Punch IOT	5
DECtape IOT	3
Program Control IOT	13
File Control IOT	13

For more information, see the self-teaching manual, "PDP-8 Programming," "TSS/8 Timesharing System Users Guide," and the Digital handbooks, "Introduction to Programming," and "Programming Languages."

ALGOL

ALGOL-60

ALGOL (an acronym for ALGOrithmic Language), a popular international high-level scientific language, has highly sophisticated program blocking and logical operations. The version of ALGOL implemented under Time-shared-8 is "Subset ALGOL 60 (IFIP)," available from DECUS. It is a one-pass compile-and-go language with convenient interactive editing and self-explanatory error diagnostics.

BOOLEAN EXPRESSIONS

A powerful feature of ALGOL is its logical (Boolean) operations. Programs may use the following Boolean operators to form logical expressions: TRUE, FALSE, NOT, AND, OR, IMP (implies), and EQU (equivalence). A Boolean expression can be used directly in a conditional (IF) statement or can be used to assign a logical value to a Boolean variable, for example:

```
B1:=B2 'OR' I-J <5*K
B3:='TRUE'
```

COMPOUND STATEMENTS

Unlike the IF statement in FORTRAN or BASIC, the IF conditional in ALGOL has several extended forms, for example:

```
'IF' I>J 'THEN' WRITE...'ELSE' WRITE...
'IF' B1 'THEN' 'FOR' V:=A 'STEP' B 'UNTIL' C 'DO' S
```

Up to 18 FOR and conditional IF statements can be embedded for incredibly powerful logical operations.

ALGOL STATEMENTS

STATEMENT	DESCRIPTION
'BEGIN'	Opening of program or block.
'END'	Terminate program or block.
'REAL' A,B,C;	Real number variable declaration.
'INTEGER' I,J,K;	Integer variable declaration.
'BOOLEAN' B1, B2;	Boolean variable declaration.
'ARRAY' A[1:10], B[O:N, O:Y]	Array declaration (1 or 2 dimensions)
'SWITCH' S:=L1, S2, STOP	Computed GOTO.
'GOTO' L;	Branch to statement L.
'COMMENT' TEXT;	Permits non-executing comments.
'IF' R 'THEN' S;	Conditional execution, R is a relation, S is any statement.
'IF' R 'THEN' S1 'ELSE' S2;	As above; S2 may also be a conditional.
'FOR' V1:=A1,A2,A3 'DO' S1;	Statement S1 is repeated for values A1,A2...
'FOR' V1:=X1 'STEP' X2 'UNTIL' X3 'DO' S1	Statement S1 is repeated for values X1 to X3 in steps of X2.
READ (u, v_1, v_2...);	Read variables v_1, v_2...from unit u.
WRITE (u, v_1, v_2...);	Write variables v_1, v_2...or text to unit u.
SKIP;	Skip a line in output.

FOCAL

FOCAL (an acronym for Formulating On-line Calculations in Algebraic Language) is an on-line, conversational language designed to help scientists, engineers, and students solve numerical problems. FOCAL, a JOSS-type language, was specifically designed for Digital PDP-8-family computers and, therefore, gives the user a sophisticated and powerful set of commands to solve scientific and research problems.

CALCULATOR MODE

FOCAL makes its full calculating power available without the necessity of writing a stored program. For example, to calculate the volume of a sphere, the user could type:

```
* SET PI=3.14159; SET R=9.12739
* TYPE "VOLUME" R↑3 *PI * 4/3
VOLUME=1791.6393
```

SUBROUTINES

FOCAL's handling of subroutines allows program control to transfer to a group of steps (normal subroutine) or a single step *anywhere in the program,* and then return automatically to the statement following the "DO" subroutine call. Subroutines may be terminated unconditionally or conditionally upon encountering a RETURN statement.

FOCAL STATEMENTS

STATEMENT	DESCRIPTION
ASK v_1, v_2,...v_n	Get v_1, thru v_n from TTY.
COMMENT	Non-executing line.
DO I	Enter subroutine at line I.
ERASE d	Erase lines defined by d.
FOR v=e_1, e_2, e_3	Set up program loop. Define v values
FOR v=e_1, e_3	beginning at e_1 to e_3 in increments of e_2.
GO	Starts program execution.
GO?	Traces program until next "?" or error or program completion.
GOTO I	Transfer control to line I.
IF(e) I_1, I_2, I_3	Branch to statement I_1, I_2, or I_3 if expression e is less than, equal to, or greater than zero.
LIBRARY CALL name	Calls stored program from disk.
LIBRARY SAVE name	Saves program on disk.
MODIFY I	Edit line I.
QUIT	Terminate execution.
RETURN	Terminates subroutines.
SET v=e	Set variable v equal to expression e.
TYPE e_1, e_2,...e_n	Prints values of variables, expressions or text strings.
WRITE d	List program lines defined by d.

SOFTWARE

RESOURCE SHARING

USER ACCESS TO PERIPHERAL DEVICES

Resource sharing is the means by which Timeshared-8 allows individual users to have temporarily exclusive use of a peripheral device, *while the system is timesharing.* A user may use the device for as long as needed, then release it so that it may be assigned to another user. For paper tape files, Timeshared-8 offers a high-speed reader and punch. For more general bulk storage, the user may store his programs and data on DECtape, Digital's low-cost magnetic tape units. Timeshared-8 systems may be equipped with up to eight DECtape units. For long listings, the line printer may be used, and for data input on punched cards or pencil-marked cards, a punched or optical card reader may be utilized.

Timesharing makes access to the computer and on-line disk storage economically feasible; resource sharing completes the concept by allowing bulk storage and high-speed input/output devices to be shared. Only the combination of resource sharing plus timesharing gives each on-line user the power of the total computer system.

FILE STORAGE

Small system timesharing does not imply a reduced need for file storage. Timeshared-8 systems typically service a large number of users—often several hundred. Each of these users may have many files to be stored. Timeshared-8 provides a broad hierarchy of storage capabilities: low-speed paper tape for short or infrequently used programs and data: high-speed paper tape for somewhat larger files; inexpensive DECtape for unlimited storage; and up to one million words (two million bytes) of on-line disk storage for frequently used files and files which are shared by several users.

DECTAPE

The standard Timeshared-8 configuration includes two DECtape units. DECtape is virtually indestructible mylar magnetic tape on 4-inch reels. Unlike paper tape or tape cassettes, DECtape may be randomly referenced at any point in the reel, and it may be read or written in either direction. Each reel holds 370,000 characters of information, the equivalent to 5 boxes of tab cards with 40 columns punched into every card, or *one-half mile* of paper tape, which would require seven hours to read. In contrast, an entire reel of DECtape can be read into the computer in a few minutes.

UTILITY PROGRAMS AND COMMANDS

LOGGING IN AND OUT

Users log in to the system by typing LOGIN 1234 ABCD (this command does not print on the terminal). "1234" represents the user account number (more than one user may use the same account; for example, 9th grade algebra, Section 2). "ABCD" represents the password. When a user logs out, he is given a summary of his connect time, the actual compute time used, and any file usage. This information is also available to the system manager for accounting or billing purposes.

SYSTEM STATUS AND LIBRARY

The SYSTAT command gives a summary of each user on the system by account number, terminal being used, the system program he is running, the exact running state and his current connect time. SYSTAT also reports on any devices that are assigned to individual users and the current state of the device. The amount of free core and disk space is also reported.

The Timeshared-8 Monitor maintains a library of disk files for each user and a "public" system library. The CATALOG utility program lists the contents of the user's library by file (or program) name, size, protection code, and date of creation.

EDITOR

The Timeshared-8 Editor provides the user with a powerful tool for creating and modifying source files on-line. EDIT allows the user to delete, insert, change, and append lines of text or code, and then obtain a clean listing of the updated file. EDIT also contains commands for searching the file for a given character. FORTRAN, ALGOL, and PAL-D programs are all created using the Editor.

DEBUGGING

ODT (Octal Debugging Technique) is a powerful octal debugging tool for testing and modifying PAL-D programs on the Timeshared-8. It allows the user to control the execution of his program and, where necessary, make immediate corrections to the program without the need to reassemble.

PERIPHERAL DEVICE CONTROL

PIP (Peripheral Interchange Program) provides a convenient means of transferring files between various disk libraries or between disk and high- or low-speed paper tape. To punch out a desired file, PIP obtains that file from the disk and punches it on high- or low-speed paper tape. Similarly, to load a paper tape, PIP inputs the tape from the reader, then outputs it to a disk file.

COPY is the intermediary between disk and DECtape and is used in a manner similar to PIP. In addition, COPY can format a blank DECtape and can list a DECtape directory.

OTHER LANGUAGES

Any language or program which can run on a 4K PDP-8/E can run on Timeshared-8. For example, QUICKPOINT for numerical control of machine tools; TRAC, a list-processing language; SAIBOL, another list-processing language; and FOCARL, an advanced version of FOCAL, all run on Timeshared-8.

HARDWARE

CENTRAL PROCESSING UNIT

The heart of Timeshared-8 is a PDP8/E computer. Among the unique features of the PDP8/E is the OMNIBUS slot independent concept. Memory, peripherals, controllers, etc. can plug into any slot in the OMNIBUS. This means easy expansion and alternative configurations as needs grow and change.

Also, the PDP8/E is UL approved. On the test line PDP8/E computers are shaken, baked, frozen and dropped. A system exerciser runs *each and every* system including all peripherals before it leaves the plant. Calculated mean time between failure (MTBF) is 8050 hours—a figure verified by actual field performance.

POWER FAIL DETECT/AUTO RESTART

Adding to the reliability of Timeshared-8 is power fail detection with automatic restarting. In case of a dip in voltage, improper shutdown of the system or accidental removal of the power plug, the system recovers automatically and resumes operation when power is restored without loss of program or vital data.

DECTAPE

Timeshared-8 comes complete with a dual DECtape drive and controller. DECtape is so reliable that it's used in hundreds of hospitals and clinical laboratories where the occurrence of an error is intolerable. It's also used in hundreds of industrial plants, banks, newspapers and schools.

HIGH-SPEED PAPER TAPE READER AND PUNCH

The paper tape reader photo-electrically reads 8-channel, fanfold, perforated tape at 300 characters per second. The companion paper tape punch operates at 50 characters per second. Both include hoppers for handling fanfold tape.

FIXED-HEAD DISK

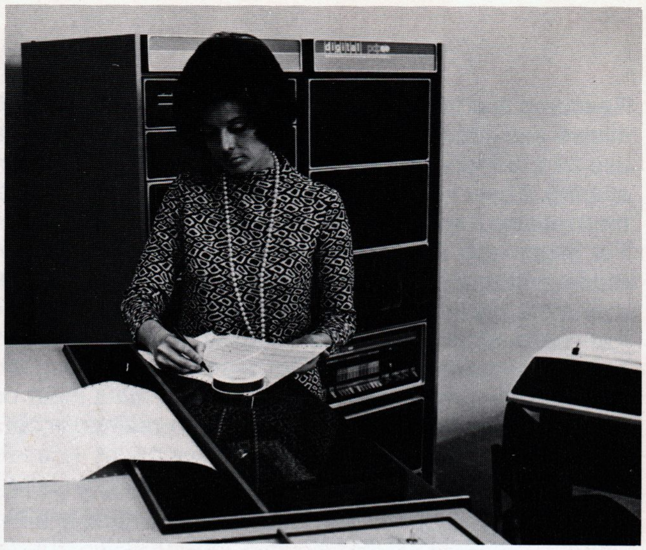
The RF/RS08 control and fixed-head disk combine to provide fast, random access swapping and bulk storage for Timeshared-8. One disk stores 262,144 words of data. Four disks can be combined for a total of one million words of storage. Fast track-switching time permits spiral read or write on the 128 data tracks.

LINE PRINTER

The LS8-E Line Printer was designed to meet the need for a low-cost, medium speed, highly reliable printer for the PDP-8/E. It prints at a rate of 165 characters/second with up to 132 characters per line. Printing speed ranges from 60 to 220 lines per minute. It prints both standard font and, for distinctive headings, a double-width elongated character face.

CARD READER

The optical mark reader reads *marked or punched* tab cards at a rate of 300 cards per minute. No special pen or pencil is needed to mark the standard 12-row, 40-column optical mark card. The control circuit for the card reader is mounted on a single quad module that plugs into the OMNIBUS.



DECWRITER

DECwriter combines solid state reliability with high print speed, (30 characters per second), quiet operation, and economy. With program and data storage on DECtape, it's no longer necessary to have the teletype paper tape reader and punch for program storage. Hence, the DECwriter, operating at three times the speed of a teletype, is the logical choice for one or more terminals on Timeshared-8.

DECTERMINAL

The DECterminal is an alphanumeric CRT terminal which is noiseless, fast (up to 240 cps), reliable and economical. It uses large, easy-to-read characters (72 characters per line, 20 lines displayed) and drives up to 12 standard television monitors.

PLOTTERS, OTHER DISPLAYS

Timeshared-8 supports most of the standard teletype-compatible plotters on the market. Plotters open up the world of coordinate geometry, non-determinant algebra, and computer art. Support routines in BASIC are available from DIGITAL for the Timeshared peripherals, TSP-212, and the Omega-T Fasplot plotters.

Timeshared-8 also supports the Tektronix 4010 graphics display terminal for plotting and computerized design in the interactive mode.

TELETYPE

Workhorse of the computer and communications world, the ASR-33 Teletype is the "standard" terminal of Timeshared-8. The Teletype operates at 10 characters per second, and has a built-in paper tape reader and punch for saving and reusing programs from individual terminals. The Teletype is the lowest cost terminal for Timeshared-8.

REMOTE TERMINALS

"Hardwired" terminals may be located up to 1500 feet away from the central processing unit. However, Timeshared-8 may also be used over standard voice-grade telephone lines (up to 16 terminals—all but the console) using standard Bell 103A modems or equivalent at the computer end.

At the remote site, all that is needed is a telephone and any one of the above terminals equipped with an acoustic coupler.

SUPPORT

DOCUMENTATION

Standard documentation with Timeshared-8 includes system user's guides, a system manager's guide, a handbook describing all the languages, and manuals for the use and maintenance of all hardware components.

In addition, an optional textbook/learning aid kit is available. It includes software, textbooks, curriculum materials, teacher guides, and visual aids for the use of the computer in the classroom. Many of the materials were developed by Digital and its users; the rest were assembled in cooperation with leading textbook publishers. Together, they provide the tools to integrate Timeshared-8 into the classroom quickly and effectively.

TRAINING

Although Timeshared-8 is simple to operate, four or five weeks of formal classroom training are included with purchase of the system. Since courses are offered in one-week units, the five weeks may be divided among more than one person if desired. Training sessions are conducted at Maynard, Massachusetts, Palo Alto, California, or any one of the other eight Digital worldwide training centers.

DIGITAL EQUIPMENT COMPUTER USERS SOCIETY

To insure a means for users to exchange materials of common interest, Digital supports a users' society, DECUS. Free membership in DECUS accompanies the purchase of Timeshared-8. Members may submit programs or techniques of general interest, which then become available to other members.

INSTALLATION

Each Timeshared-8 system undergoes a comprehensive checkout before it leaves the plant. At the installation site, a Digital field engineer will again run exhaustive tests on all the hardware to make sure everything functions perfectly. For the next three months the system is under full warranty covering all necessary parts, labor, and travel.

As soon as installation is completed, a software support specialist will provide training and further assistance. This includes a three-day on-site training program tailored to meet the particular needs of the users.

MAINTENANCE

Maintenance for Timeshared-8 may be purchased by contract or on the basis of individual service calls. Service and parts are backed up by an extensive world-wide network of branch, district and regional service centers. Over 1000 field service engineers in 126 locations stand ready to keep Timeshared-8 running with minimal downtime.

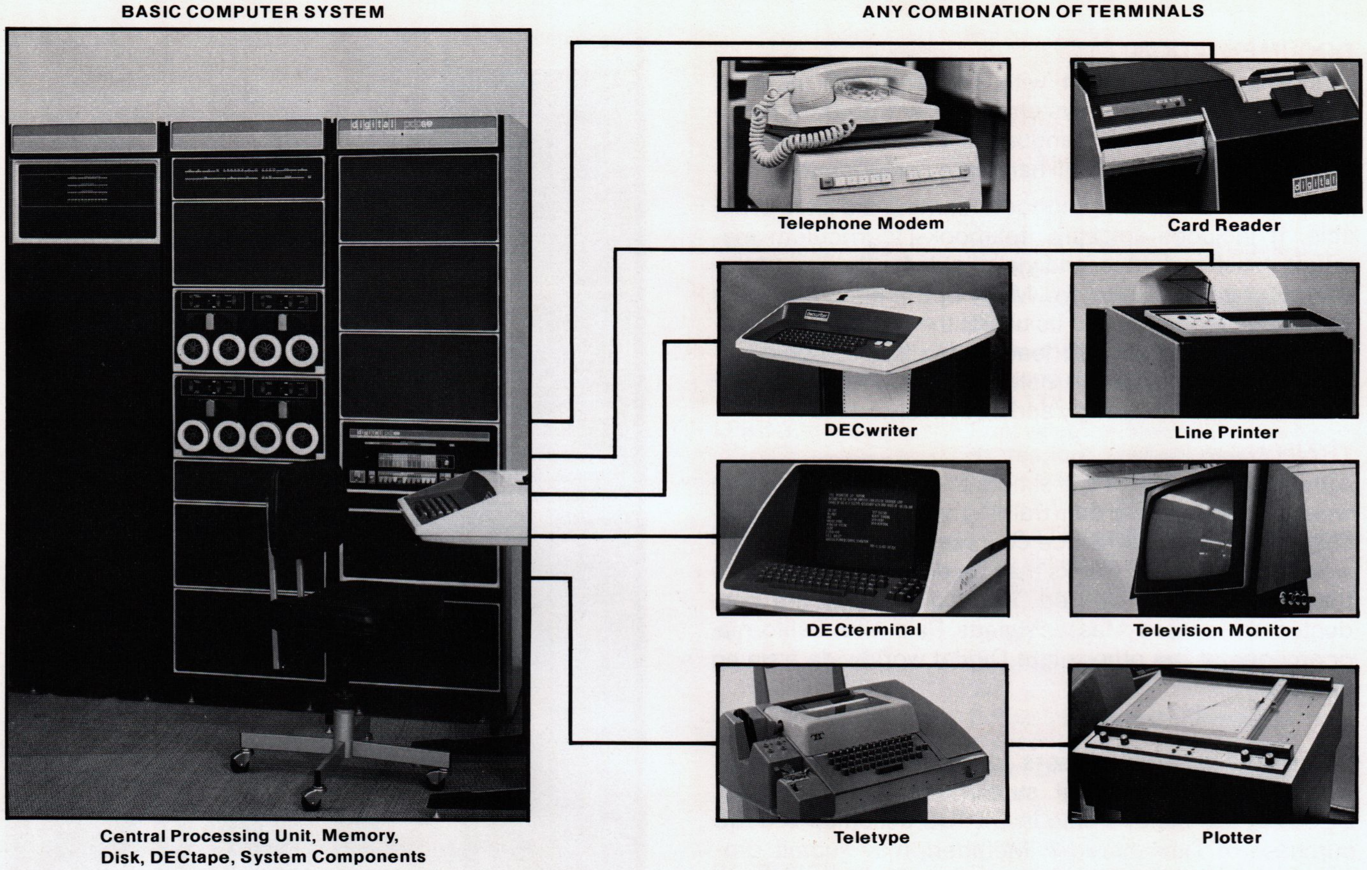
ENVIRONMENTAL REQUIREMENTS

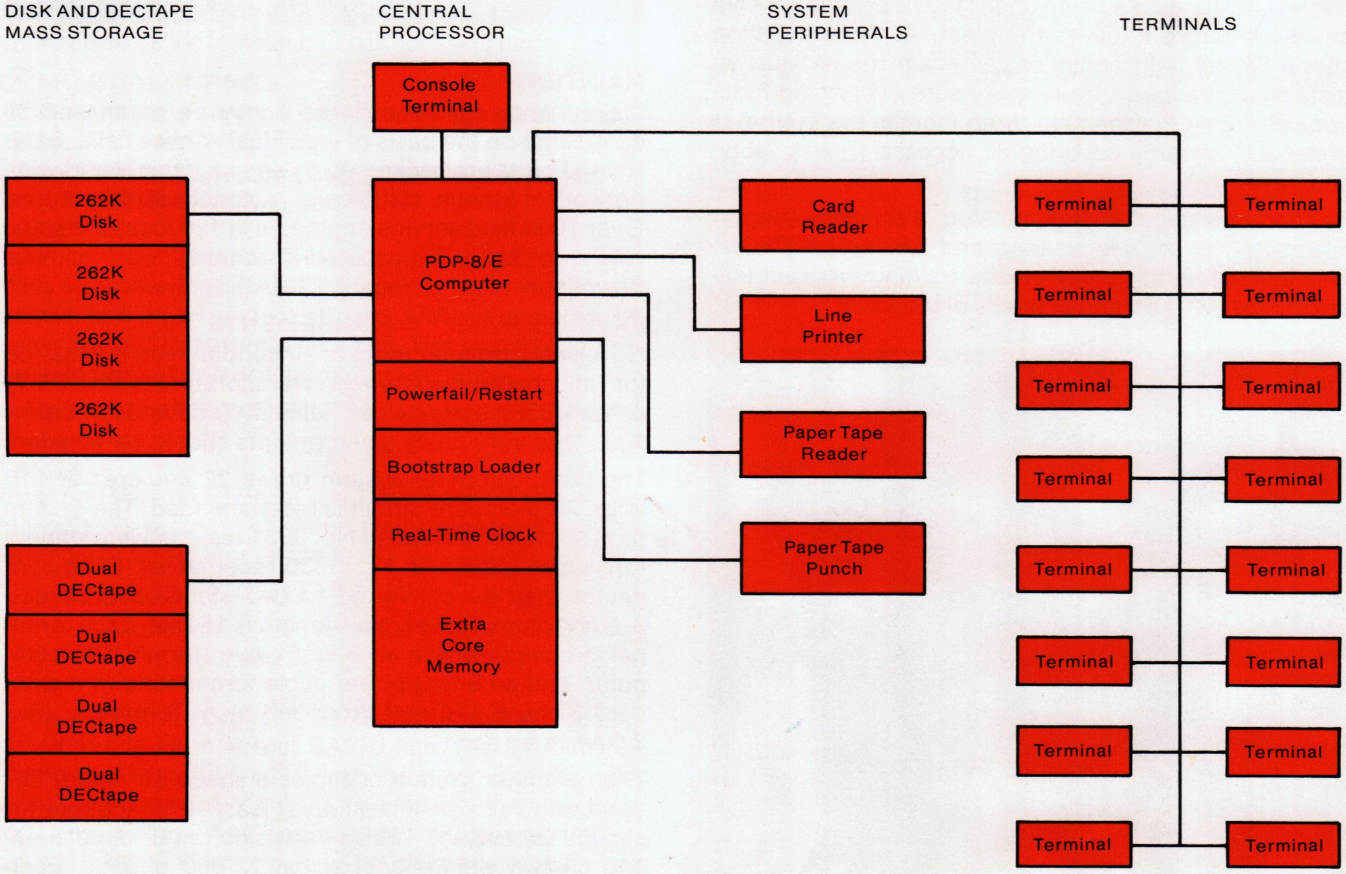
No formal computer room or air conditioning is required for Timeshared-8. Extremes of temperature (above 85°F, below 70°F), extremes of humidity (above 90%, below 10%), and very dusty environments should be avoided.

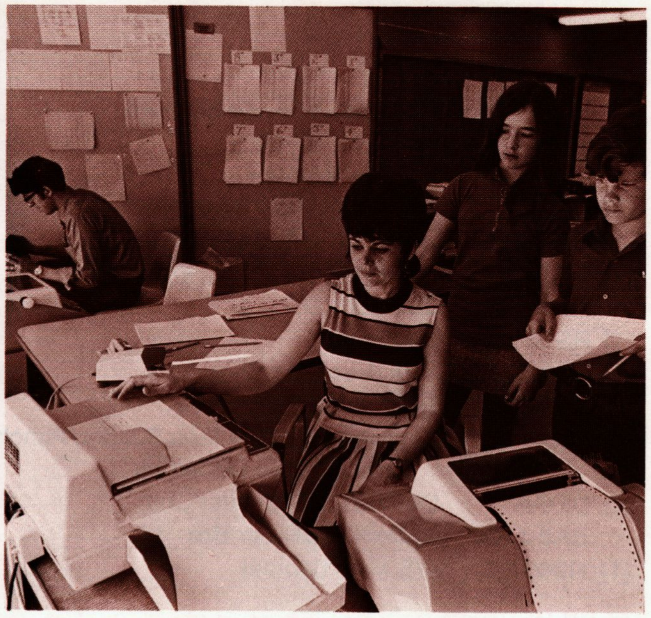
The basic computer system draws 22 amperes at 115 volts. A 30-ampere circuit is recommended. The system has two 3-prong Hubbell No. 3331 male power connectors which mate with No. 3330 receptables. Each connector may be converted to two standard grounded 3-prong plugs. Power cable length is 15 feet. Each terminal is equipped with an 8-foot cable (terminal to computer) and an 8-foot power cable terminating in a standard 3-prong 115 volt grounded plug. Terminals draw 2.0 amperes each.

The computer system occupies a space 66″ wide, 25″ deep, and 75″ high. It requires at least 18″ in the rear for service access and 12″ on each side for air circulation. The system weighs approximately 860 pounds. Each terminal is 22″ wide x 19″ deep and weights 70 pounds.

TIMESHARED-8 CONFIGURATION CHART







CONFIGURATION WORKSHEET

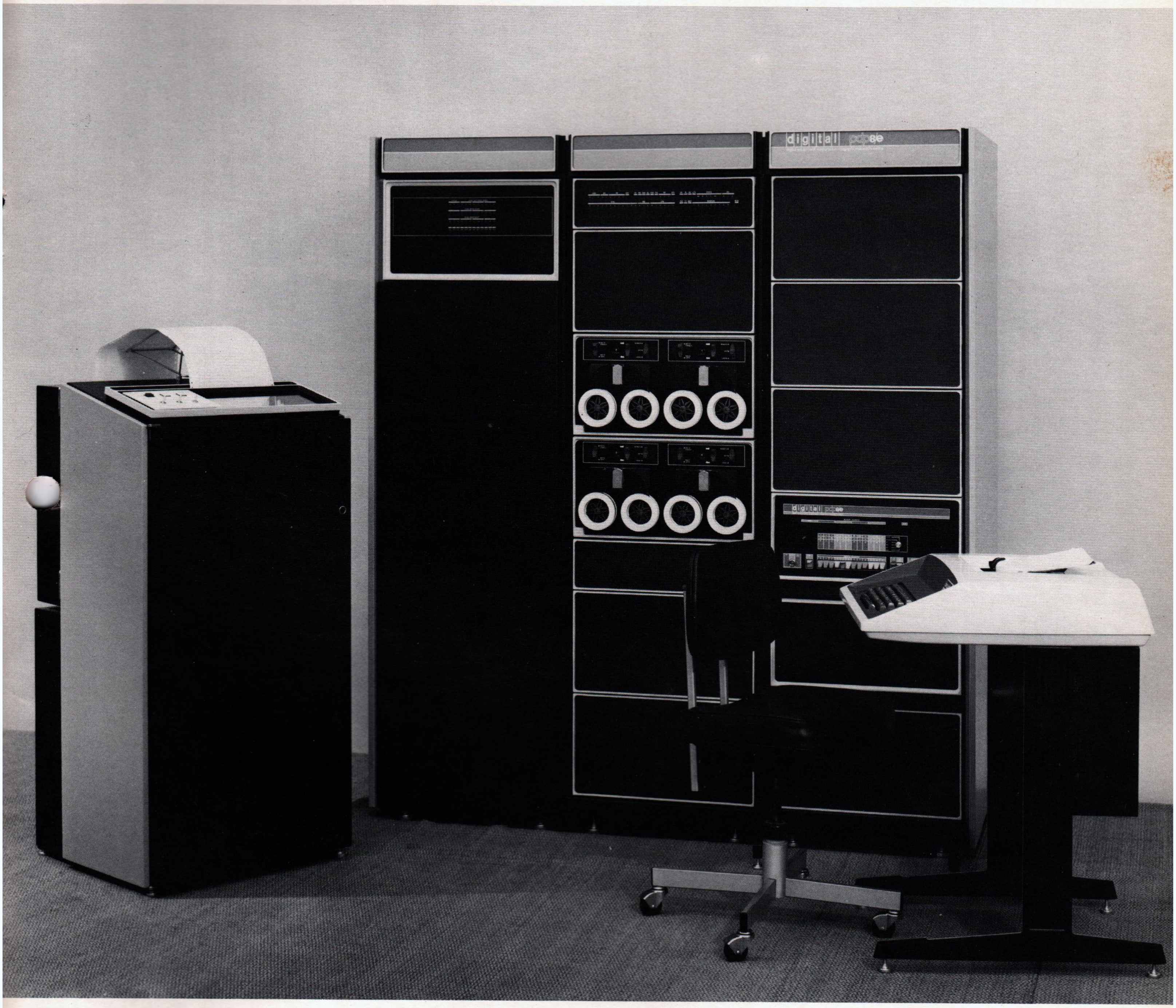
Number	Description	Quantity	Price (2)	Mo. Maint. (2)
BASIC SYSTEM				
(1) PDP8E-AE	Computer, 8K Core Memory			
(1) MM8-E	4K Core Memory			
MM8-EJ	8K Core Memory			
(1) KP8-E	Power Fail/Auto Restart			
(1) MI8-EG	EduSystem Bootstrap			
(1) DK8-EA	Real-Time Clock			
(1) RF08	Disk Control			
(1) RS08	262K Disk			
(1) KD8-E	Data Break Interface			
(1) KA8-E	External Bus			
(1) PL8-E	High-Speed Paper Tape Reader/Punch and Console DECwriter			
(1) BE8-A	OMNIBUS Expander Unit			
BA8-AA	System Expander Box			
(1) H960-BC	8/E Main Cabinet			
PERIPHERALS				
TC08	DECtape Control			
TU56	Dual DECtape Transport			
CM8-F	Optical Mark Card Reader			
LS8-E	Line Printer			
TERMINALS				
LT33-DC	Teletype			
KL8-E	Teletype Interface			
LA30-PA	DECwriter			
LC8-E	DECwriter Interface			
VT05-B	DECterminal CRT			
KL8-EC	VT05 Interface			
H308	Null Modem for VT05			
KL8-EA	Remote Teletype Interface			
DF01-A	Acoustic Coupler			
SOFTWARE				
(1) QFE50-SB	Timeshared-8 Monitor			
QFE50-SB	Batch Timeshared-8 Monitor			
QFELP-01	Textbooks and Teaching Aid Kit			

CONFIGURATION GUIDELINES:

1. Core Memory. Minimum system size is 12K for up to 4 users. Add 4K of memory for each additional 4 (or fewer) users.
2. 262K disk. System monitor occupies 20K of first disk; each user occupies 4K for swapping; remainder is available for file storage. Additional disks (up to 4) are totally allocated to file storage.
3. DECtape. Maximum of 8 drives (4 dual drives).
4. High-speed terminals (LA30, VT05). Maximum of 4.

NOTES:

1. One of each item marked (1) is required for a basic Timeshared-8 system.
2. Price Lists are available showing local purchase, lease and monthly maintenance prices for the 20 countries in which Timeshared-8 is sold and serviced.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